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(71) Applicant(s)
Smith & Nephew plc

(Incorporated in the United Kingdom)

2 Temple Place, Victoria Embankment, LONDON, WC2R 3BP, United Kingdom

(72) Inventor(s)
John Rose
Alan Farthing

(74) Agent and/or Address for Service
S H M Gibson
Smith & Nephew Group Research Centre, Corporate Patents & Trade Marks Department, York Science Park, HESLINGTON, York, Y01 5DF, United Kingdom

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(56) Documents Cited
WO 95/13778 A1 WO 86/01400 A1 US 4676784 A
US 4560372 A US 4235237 A

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(54) An absorbent dressing, with apertures into which the absorbent can expand

(57) An absorbent article such as a wound dressing having at least one aperture in at least one surface thereof, the apertures define a space for the absorbent article to expand into as it absorbs fluid. The expansion of the material into such spaces reduces the net outward expansion of the layer and so helps to reduce lifting of dressings with relatively inextensible backing layers. The apertures may be formed by cutting or around spacers placed in the dressing mould while the absorbent is in a flowable state.

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Fig1

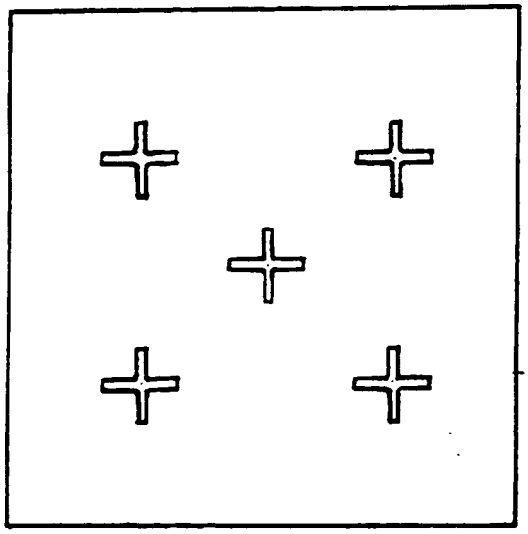
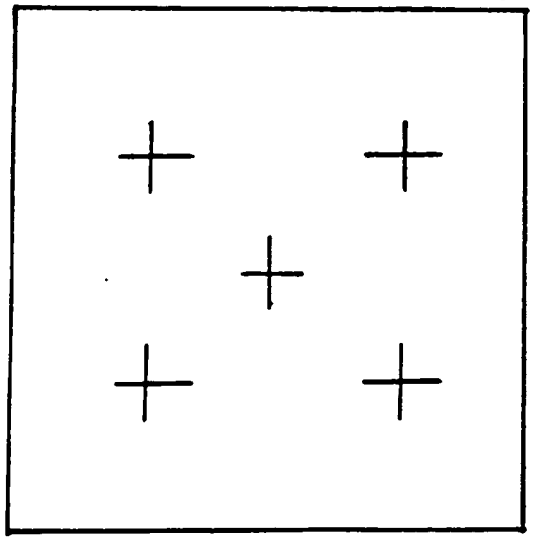


Fig 2



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ABSORBENT ARTICLE

The present invention relates to absorbent articles, and especially to articles which are used to absorb body fluids such as absorbent dressings.

When an absorbent absorbs a liquid it will usually increase in volume. Some absorbents, such as those based on pulped materials for example, include air spaces into which the absorbent material can expand. Others do not have such spaces and so the absorbent material must expand in a different manner. When the absorbent is not constrained by non-expanding parts of the article, e.g. a backing film of a dressing, then it can expand in all directions as it absorbs liquid. A layer of absorbent material may be designed to increase in thickness as it takes up liquid.

One problem with highly absorbent dressings, which often consist of layers of different materials which are capable of expanding to different extents, is that the expansion of the absorbent may distort the shape of the dressing. This may result in the dressing lifting away from the wound to which it is applied and thus a loss in the dressing's effectiveness as a barrier to the entry of bacteria to the wound and as an absorbent for wound exudate. The lifting of the dressing may be prevented to some degree by using adhesive tape around the edges of the dressing, but this may not be effective and removal of the adhesive tape may damage the delicate skin surrounding the wound.

The above problem maybe particularly apparent in wound-dressings in which a layer of a highly absorbing material such as a hydrocolloid or hydrogel is adhered to a bacteria-proof polymeric backing film. In this situation, as the absorbent layer, which is applied to an exuding wound, absorbs exudate and expands outwards, the dressing tends to bow or curve upwards and lift away from the wound surface because the backing layer is unable to expand to the same extent as the absorbent layer. Also, because the exudate is only in contact with one side of dressing, exudate diffuses only from one surface resulting in different degrees of

expansion through thickness of dressing. This bowing tends to exert a force against any adhesive which may be holding the dressing to the skin and as the dressing lifts away from the wound the exudate may penetrate between the adhesive and the skin resulting in a further loss of adhesion. Ultimately, one part of the dressing may lift completely away from the skin, allowing wound exudate to escape from under the dressing and also allowing bacteria to enter. The dressing in this state may also be unsightly. Such highly absorbent dressings are usually used on wounds which exude fluid at a high rate, e.g. leg ulcers. It is therefore very important that wound exudate is controlled and that it is not allowed to escape from the dressing.

It is an object of the present invention to provide an absorbent article which overcomes or at least alleviates the foregoing problem.

According to the invention, an absorbent article comprises a layer of an absorbent material having at least one aperture in at least one surface thereof. The aperture(s) in the absorbent layer form spaces into which the absorbent material can expand as it increases in volume due to the uptake of liquid in use. The expansion of the material into such spaces reduces the net outward expansion of the layer and so helps to reduce bowing and lifting of dressings which have a relatively inextensible backing layer.

In a preferred embodiment, the absorbent article is a wound dressing comprising a backing layer to which a layer of absorbent material is secured. The absorbent material may comprise a paper or pulp-based material or may be a natural or synthetic woven or non-woven material. The invention may be particularly useful when the absorbent material comprises a highly absorbent material, i.e. one which absorbs greater than about 50% of its own weight of water. Such materials may include hydrocolloids, hydrogels and xerogels such as those described in EP-A-0271292.

The apertures may extend partially or fully through the absorbent layer. Apertures which extend completely through the absorbent layer are preferred. In this case, if a relatively moisture

vapour permeable backing film is present, some fluid, e.g. wound exudate may flow into the apertures and directly into contact with the backing layer. In this way excess fluid may be transmitted through the backing layer as moisture vapour without first having to diffuse through the absorbent layer. In wound dressings provided with a backing film which has a greater moisture vapour transmission rate when in contact with liquid water than when not in contact with liquid water, it would be particularly beneficial for the apertures to extend from a wound-facing surface of the absorbent layer through the absorbent layer to contact the backing film of the dressing. In this way, the backing film will transmit moisture vapour at a relatively high rate.

Preferably the absorbent layer comprises a plurality of apertures which are preferably discrete, in that they are not linked by a continuous passage through which fluid may flow so that fluid is not able to flow from an aperture near the centre of the article to the edge of the article. The apertures may be evenly distributed or they may be concentrated in a certain area or areas of the article. In the case of a wound dressing, a group of apertures is preferably concentrated in a central region of the dressing whilst the edges have fewer or no apertures. The total volume of the apertures may vary greatly, depending on the nature of the absorbent and the application. For example, a gel wound dressing in which the absorbent is a gel layer which can double its volume when it is fully saturated compared to its dry state, may have a total volume of the apertures up to 50% of the volume of the absorbent layer as a whole. For absorbents which expand less when saturated, the maximum aperture volume usable would be less.

A further advantage of the presence of apertures in the absorbent layer may be that the stiffness of the absorbent article is reduced. This may be of benefit for a wound dressing at least because a less stiff dressing will conform better to the shape of the body when it is applied and so it may be more comfortable, easier to apply and, in the case of an adhesive dressing, the adhesion may be improved.

In another aspect of the present invention, there is provided a method of manufacturing an absorbent article as hereinto before described including the step of forming an aperture in said absorbent material.

The apertures may be formed in the absorbent layer either during formation of the absorbent or afterwards. For example, when the absorbent is in a flowable state during its formation, it can be formed around spacers or inserts placed in e.g. a mould in which it is formed. Alternatively a mould could be shaped to include such inserts as an integral part. It may also be possible to form spaces in a fluid absorbent by e.g. blowing the absorbent as it is formed. For example, it may be possible to form spaces or apertures in a hydrogel by directing focussed jets of air into a liquid pre-polymer as the pre-polymer cures to form a gel. If the absorbent is formed without apertures, then apertures may be formed by cutting into or through the absorbent or by other means, e.g. by pressure.

The invention will now be further described, by way of example only with reference to the accompanying drawings which are:

Figure 1, a schematic plan view of a dressing made as described in Example 2.

Figure 2, a schematic plan view of the dressing shown in Fig 1 after it has absorbed a significant volume of liquid.

Two types of gel dressing were made as described in the following examples.

Example 1 (Control)

An adhesive polyurethane gel dressing was made by casting a viscous liquid polyurethane pre-polymer onto a film of hydrophilic polyurethane and cross-linking the pre-polymer to form a gel. The polyurethane gel pre-polymer was formed by the reaction of a polyisocyanate with a polyoxyalkylene diol mono alkyl ether and it was cross-linked by heating with a polyol. The general method of

preparation of such gels is described in EP - 0282554. The dressing, consisting of a hydrophilic polyurethane film backing layer having one side completely covered with a layer of the gel adhesive (about 2mm thick) was then cut to size (10cm x 10cm).

Example 2

An adhesive polyurethane gel dressing was formed in the same way as in Example 1 above, but five small cross-shaped pieces of a plastic material (sold as tile-spacers) were placed onto the backing film before the gel pre-polymer mixture was cast onto the film. When the gel had been cured, the spacers were removed, leaving five cross-shaped holes extending through the thickness of the gel, but not through the backing film. The apertures or holes could have been made in any shape, but the cross-shapes were found to be convenient.

The performance of the dressings during absorption of wound exudate was tested by applying them to a simulation "wound" model. The model comprised a steel plate which contained a 5cm x 5cm recess into which heat-inactivated horse serum was fed at a rate of 6860g/m^2/24 hours. The example dressings were stuck over the recess; the inherent tackiness of the gel was used to adhere the dressings to the surrounding steel plate, i.e. no adhesive tapes were used to hold the dressings down. The dressings were left in place for up to 72 hours, or until the dressing leaked. Leakage of the dressing was defined as when the recess in the plate was open to the air (allowing the "exudate" to leak from underneath the dressing).

The dressings of Example 1 i.e. those which did not have holes in the absorbent layer, leaked after a period of 30-46 hours. This was because the gel had expanded as it absorbed the "exudate" from the model and the dressing had bowed away from the plate as a result because the gel nearest the "wound" had absorbed more fluid than gel further from the wound and also because the backing film limited the extent to which the gel located adjacent that film would expand. The dressings of Example 2, made

with holes in the gel, remained in place for the full 72 hour duration of the test.

The dressings of Example 2 are illustrated schematically in Figs 1 and 2. In Fig 1, the cross-shaped holes appear as spaces in the film. Fig 2 shows how the holes have closed to slits as the gel has expanded into the space provided by the holes as water or exudate is absorbed into the gel.

Claims

1. An absorbent article comprising a layer of absorbent material having at least one aperture in at least one surface thereof, said aperture defining a space into which said absorbent material may expand as said absorbent material absorbs liquid.

2. An article according to claim 1 wherein said absorbent material comprises a paper or pulp-based or natural or synthetic or woven or non-woven material.

3. An article according to claim 1 wherein said absorbent materials comprises a hydrocolloid, hydrogel or xerogel.

4. An article according to any preceding claim wherein said material can absorb greater than 50% of its own weight of water.

5. An article according to any preceding claim wherein said absorbent material is provided with more than one aperture.

6. An article according to any preceding claim wherein said aperture(s) comprise up to 50% by volume of said material.

7. An article according to any preceding claim wherein said aperture(s) are discrete.

8. An article according to any preceding claim wherein said aperture(s) extends completely through said absorbent layer.

9. An article according to any of claims 1 to 7 wherein said aperture(s) extend partially through said absorbent layer.

10. An article according to any preceding claim wherein said article is a wound dressing.

10. A wound dressing according to claim 9 wherein said aperture(s) is disposed on a wound-facing side of said absorbent material.

11. A wound dressing according to claim 9 or 10 wherein said wound dressing comprises a backing layer disposed on a non-wound facing side of said dressing.

12. A wound dressing according to claim 11 wherein said backing layer has a moisture vapour transmission rate greater when in contact with liquid water than when not in contact with liquid water.

13. A method of manufacturing an article according to claim 1 including the step of forming an aperture in an absorbent material after formation of said absorbent material.

14. A method of manufacturing an article according to claim 13 wherein said aperture is formed by cutting said absorbent material.

15. A method of manufacturing an article according to claim 1 including the step of forming an aperture in an absorbent material during formation of said absorbent material.

16. A method of manufacturing an article according to claim 15 wherein said aperture is formed when said absorbent material is in a flowable state during formation of said absorbent material.

17. A method of manufacturing an article according to claim 16 wherein said aperture is formed by forming said absorbent material in a flowable state around a spacer or insert.

18. A method of manufacturing an article according to claim 16 wherein said aperture is formed by directing focused jets of air into said absorbent material in a flowable state.

Amendments to the claims have been filed as follows

1. An absorbent article comprising a layer of absorbent material having at least one aperture in at least one surface thereof, said aperture defining a space into which said absorbent material may expand as said absorbent material absorbs liquid.

2. An article according to claim 1 wherein said absorbent material comprises a paper or pulp-based or natural or synthetic or woven or non-woven material.

3. An article according to claim 1 wherein said absorbent materials comprises a hydrocolloid, hydrogel or xerogel.

4. An article according to any preceding claim wherein said material can absorb greater than 50% of its own weight of water.

5. An article according to any preceding claim wherein said absorbent material is provided with more than one aperture.

6. An article according to any preceding claim wherein said aperture(s) comprise up to 50% by volume of said material.

7. An article according to any preceding claim wherein said aperture(s) are discrete.

8. An article according to any preceding claim wherein said aperture(s) extends completely through said absorbent layer.

9. An article according to any of claims 1 to 7 wherein said aperture(s) extend partially through said absorbent layer.

10. An article according to any preceding claim wherein said article is a wound dressing.

11. A wound dressing according to claim 10 wherein said aperture(s) is disposed on a wound-facing side of said absorbent material.

12. A wound dressing according to claim 10 or 11 wherein said wound dressing comprises a backing layer disposed on a non-wound facing side of said dressing.

13. A wound dressing according to claim 12 wherein said backing layer has a moisture vapour transmission rate greater when in contact with liquid water than when not in contact with liquid water.

14. A method of manufacturing an article according to claim 1 including the step of forming an aperture in an absorbent material after formation of said absorbent material.

15. A method of manufacturing an article according to claim 14 wherein said aperture is formed by cutting said absorbent material.

16. A method of manufacturing an article according to claim 1 including the step of forming an aperture in an absorbent material during formation of said absorbent material.

17. A method of manufacturing an article according to claim 16 wherein said aperture is formed when said absorbent material is in a flowable state during formation of said absorbent material.

18. A method of manufacturing an article according to claim 17 wherein said aperture is formed by forming said absorbent material in a flowable state around a spacer or insert.

19. A method of manufacturing an article according to claim 17 wherein said aperture is formed by directing focused jets of air into said absorbent material in a flowable state.

The Patent Office

II

Application No: GB 9619891.6 **Examiner:** Dr Jason Bellia
Claims searched: 1-18 **Date of search:** 19 December 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): A5R (RPR, RPK, RPF)

Int Cl (Ed.6): A61F (13/02, 13/15, 13/46, 13/48, 13/50)

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	WO 95/13778 A1	(PHAN) page 3 line 9-11 and 23-26, page 9 and 10, page 16 line 35-39, figure 1 & examples III and IV	1,2,4,8, 15,16
X	WO 86/01400 A1	(RIEDEL) page 15 line 12-20 & page 17 line 24-34	1,2,5,9 & 13
A	US 4676784	(PIENIAK) column 3 line 55-63 and figures 1 & 3	1-18
X	US 4560372	(PIENIAK) column 2 line 45-52, column 3 line 13-23 and 33-34 & column 6 line 31-33	1-3,5,7,8, 10(page 7), 10 (page 8) 11,13 & 14
X	US 4235237	(MESEK) column 3 line 49-63 figures 1 and 2	1-5, 8 10(page 8) 15 & 16

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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